

CE2810: Embedded Systems Software II

Dr. Walter Schilling

Spring, 2011-2012

1 Administrative Details

Instructor: Dr. Walter W. Schilling, Jr.
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Course Web Page: <https://myweb.msoe.edu/~schilling/msoe/spring2012/ce2810/ce2810.shtml>
Credits: 3.0
Meeting Times: MF 14:00 AM-14:50 KH212(Class)
W 14:00 - 15:50 S314(Lab)

2 Catalog Description

This class builds on CE-2800 and introduces C as a high-level language for embedded systems programming. C pointers are introduced. C functions are introduced. Parameter passing by value versus using pointers is described. Interrupts in C are introduced and then the C/assembly interface is described. Designing modular applications by use of multiple files is described. Several subsystems, such as the USART and Timer system, are introduced. Key concepts are applied in laboratory exercises.

3 Outcomes

Upon successful completion of this course, the student will be able to:

1. combine assembly and a high-level language to complete basic embedded system programming tasks
2. employ embedded systems development tools
3. link multiple files to create a larger application
4. design and write C functions
5. use interrupts in C to perform I/O
6. use the various subsystems of the processor in practical applications

4 Pre-Requisites

- SE-1011
- CE-2800

5 Textbook

None available

6 Computer Software Resources

This course has been constructed assuming your laptop is using the standard MSOE image. If your laptop has been modified from this image, there is the potential of difficulties arising during the course of this class. If you have modified your image, you are responsible for maintaining normal operation with the provided software, which may or may not be compatible with your installation.

In any case, no matter the configuration of your laptop or the state of your laptop, you are responsible for completing all assignments on time. **Absolutely no extensions will be granted due to Computer difficulties.**

7 Class Participation and Activities

Lecture will be a mix of instructions, discussion, and code examples. Participation is expected.

Class attendance is mandatory. If you are unable to attend a class for any reason, please inform the professor as soon as possible.

Excessive, unexcused absences may result in a grade reduction.

Attendance is required at all lab sessions. It is expected that you will be working on the assigned lab assignment through the lab period unless the assignment is completed and submitted. You must stay for the entire lab period unless the current assignment is complete and turned in. This includes both the software that is to be written / developed as well as the written report on the lab activity. Failure to abide by this policy may result in a grade reduction.

8 Grading

Grades will be based upon Midterm Exams, Lab Work, and a comprehensive final exam.

Midterm Exams (1)	25%
Labs	30%
Homework and Quizzes	20%
Final Exam	25%
Total	100%

Grades will be based upon the following grading scale

A	92-100
AB	89-91
B	82-88
BC	80-81
C	71-79
D	65 - 70
F	Below 65

9 Late Submission Policy (Non-Homework)

Assignments are due to the designated time and place. Late submissions will not be tolerated and may result in a 10% per business day late penalty from the due date until the assignment is received.

10 Early Submission Bonus

In order to encourage timely completion of assignments, an early submission bonus will be available for all lab assignments. Lab assignments submitted 48 hours or more in advance of the due date may receive a 10% early submission bonus. Lab assignments submitted 24 hours or more in advance of the due date may receive a 5% bonus.

11 Grading Challenges

Any grading challenges, unless specifically noted by the professor, must be submitted in writing within 5 days of the assignment being returned to the student. The writing shall clearly delineate the problem with the assignment as well as justification for the change in grade.

12 Student Integrity

All students are expected to abide by MSOE's policy on student integrity. If at any point in the semester you have a question about an assignment, please come discuss it with me.

Violations of this policy will be dealt with seriously, and may result in significant penalty, up to and including failure of the course. In specific, violations of student integrity on a lab assignment will most likely result in failure of the course.

In specific, it is expected that you will perform your own work and not work as a group or a team unless specifically allowed by the instructor. To be in possession of another student's source code or design or to submit an assignment which matches in whole or in part another student's assignment shall be considered a violation of academic integrity.

12.1 Student Integrity Policy (as stated in the MSOE Handbook)

As an institution of higher learning, MSOE is committed above all to the educational development of its students as responsible and principled human beings. As such, MSOE is accountable to all whom it serves and by whom it is scrutinized. The university has a priority interest in promoting personal integrity and in ensuring the authenticity of its graduates' credentials.

The university is similarly mindful that the professions, business and industry are concerned with ethical behavior, no less than the professional practice of their members and employees. It follows, therefore, the students of MSOE preparing for professional careers and leadership roles that are founded on responsibility and trust must observe and be guided by the highest standards of personal integrity both in and out of the classroom. The expectations of the university with respect to academic and classroom integrity are reflected in, but not limited to, the following guidelines:

1. Each student must recognize that even a poorly developed piece of work that represents his or her best efforts is far more worthwhile than the most outstanding piece of work taken from someone else.
2. Assignments prepared outside of class must include appropriate documentation of all borrowed ideas and expressions. The absence of such documentation constitutes plagiarism, which is the knowing or negligent use of the ideas, expressions or work of another with intent to pass such materials off as one's own. It is an act of plagiarism if a student purchases a paper or submits a paper, computer program, or drawing claiming it to be his/hers when he/she did not write it.
3. Each student should consistently prepare for examinations so as to reduce temptation toward dishonesty.
4. A student may not share examination answers with others for the purpose of cheating, nor should he or she, intentionally or through carelessness, give them an opportunity to obtain the same.
5. Academic dishonesty or cheating includes the act of obtaining or attempting to obtain credit for academic work through the use of any dishonest, deceptive, or fraudulent means. Cheating at MSOE includes but is not limited to:
 - Copying, in part or in whole, from another's test or homework assignments, worksheets, lab reports, essays, summaries, quizzes, etc.
 - Copying examinations and quizzes, in whole or in part, unless approved by the instructor.
 - Submitting work previously graded in another course unless this has been approved by the course instructor or by departmental policy.
 - Submitting work simultaneously presented in two courses, unless this has been approved by both course instructors or by the department policies of both departments.
 - Communicating electronically (unless approved by the instructor) during examinations with the intent to seek or provide answers.
 - Attempting to present as the student's own work, materials or papers purchased or downloaded from the Internet.
 - Any other act committed which defrauds or misrepresents, including aiding or abetting in any of the actions defined above.
 - Claiming credit for a group project or paper when the individual student made little or no contribution to the group's product.
 - Accessing reference documents during a computerized exam or quiz unless approved by the course instructor.
6. A student of integrity will not support, encourage or protect others who are involved in academic dishonesty in any way, and will furthermore attempt to dissuade another student from engaging in dishonest acts.

12.2 Lecture Note and Handout Availability

To the greatest extent possible, all lecture notes and handouts will be made available on the web following class / lab. These materials are made available for your learning enrichment. These materials, however, are governed by the Copyright Laws of the United States and are not to be distributed beyond the MSOE environment. This includes, but is not limited to, lecture notes and slides, lab assignments, homework problems, sample solutions, source code examples, and quizzes.

Failure to adhere to this policy may result in a reduction of final course grade.

13 Cell Phone Policy

To enhance learning and reduce disruptions, cell phones will be turned off during class. If a cell phone rings during class, one point will be subtracted from your final grade. Two additional points will be subtracted from your final grade for each additional offense. If your cell phone rings during a quiz or exam, the final grade for the course will be reduced by one half letter grade (i.e. from A to AB). For each additional offense during an exam, the final grade will be reduced by one full letter grades (i.e. from A to B).

Under no circumstances may a cell phone be used as a calculator during exams or quizzes.

14 Laptop Usage

No laptop usage is allowed during lecture periods unless specifically requested by the instructor.

15 Course Drops

Under no circumstances will the professor drop you from this course. If you desire to withdraw from this course, it is your responsibility to complete the process in the appropriate fashion.

16 Examinations

Midterm exams will be held during class meetings unless other arrangements are made prior to the exam. **NO MAKEUP EXAMS** will be given without advanced reason excepting documented medical or family emergencies.

17 Final Exam

Per university policy, "A final examination is required in every credit course except in courses designated by the various departments, and that exam will be administered in the two-hour block designated. The type of examination should be in agreement with that specified in the departmental course outline and announced to the class near the beginning of the quarter. Final examinations may not count more than 40% of the final grade."

The final exam for this course will be held during finals week at a time to be determined by the registrar.

18 Homework / Quizzes

Quizzes may be given weekly, either at a lecture or lab meeting. Homework may also be assigned from time to time. The lowest quiz score will be dropped. **Absolutely no make-up quizzes will be given.**

A homework assignment will be worth one quiz grade unless otherwise noted.

19 Reading Assignments

The syllabus indicates reading assignments. Students are expected to read the indicated pages prior to meeting that day.

20 Course Coverage

Tentative. Subject to change and revision based upon class progress.

Meeting	Week	Day	Topic
1	1	March 5	Course Introduction and A First 'C' Program - "Hello World"
2	1	March 9	C similarities with Java: Conditionals, loops, data types
3	2	March 12	Reading/Writing I/O Registers, constants and arrays
4	2	March 16	Pointers and arrays
5	3	March 19	Interrupts in C with the serial port
6	3	March 23	String manipulation in C
7	4	March 26	Converting Strings to numbers
8	4	March 30	Revising the Scope of C variables and Methods
9	5	April 2	Midterm Exam
10	5	April 6	No class - Good Friday
		Spring Break	Spring Break
11	6	April 16	EEPROM
12	6	April 20	Structures in C
13	7	April 23	A Structure based Device Driver Interface
14	7	April 27	The capabilities of the PreProcessor (Macros and definitions)
15	8	April 30	Function Pointers
16	8	May 4	Function Pointers, continued
17	9	May 7	Dynamic Memory Allocation
18	9	May 11	Combining Assembly and C in depth
19	10	May 14	Combining Assembly and C in depth
20	10	May 28	Final Exam Review

21 Lab Topics

Week	Date	Lab Topic
1	March 7	Pre-requisite Assessment and Working with gcc
2	March 14	Writing our first C code: Keyscan matrix and button driver
3	March 21	C Based LCD Display Driver
4	March 28	String and Text Manipulation in C
5	April 4	An Embedded Calculator - Part 1
6	April 18	An Embedded Calculator - Part 2
7	April 25	A Poor Man's Light Dimmer using AD and PWM
8	May 2	2 Player Game Part 1
9	May 9	2 Player Game Part 2
10	May 16	2 Player Game Part 3